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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations by the Du Pont Company. It also contains published reports of investigators at agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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AGRICULTURAL NEWS LETTER

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The AGRICULTURAL NEWS LETTER serves as a medium of reporting new developments and new ideas in the field of agriculture, particularly as they are related to advancements through research. Material appearing herein may be reprinted in whole or in part, in the interest of advancing the general knowledge of new agricultural practices.

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PARTNERS IN SERVICE

American farmers planting their rows of crops and the research chemist with his row of gleaming test tubes are working partners in meeting one of the most important long-range needs of the nation.

In just 20 years, more than 50 million additional mouths will have to be fed, 50 million additional bodies clothed, and 50 million additional people housed. With large surpluses of food and fiber bulging in warehouses from coast to coast, we sometimes cannot imagine a future in which all these things might be in short supply. Yet, a look at the facts gives a revealing picture.

Today, we have about 168 million people to feed, clothe, and house. By 1976, it is estimated that there will be about 216 million, an increase of better than 30 per cent. The amount of land under cultivation is limited; even ambitious irrigation and reclamation projects cannot add one-third more farmland to productive use. As a matter of fact, the spread of cities, growth of suburbs, and construction of plants in rural districts all help to reduce rather than increase the amount of land that can be planted.

What is the answer? From experience, farmers know that land can be made to produce more with better methods of cultivation, better use of farm chemicals. Even now, we are producing almost half again as much on the same amount of cropland than before World War II. An increase of one-third more will be needed in 20 years.

Much of the reason for past progress—and for future progress, as well — has been the partnership between chemistry and agriculture. Chemistry is working on many fronts to make that partnership even more profitable. New products and improved old ones will help increasingly to eliminate plant and animal disease, provide better means of growth, help conserve the soil, and destroy undesirable plants.

The chemical "hired hands" on the farm have already done their share in making it possible for the average farmer to produce enough food for himself and 19 other people. In 1920, when farm chemicals were in their infancy, and farm machinery much less developed, he could feed only seven others. If the needs of the future are to be met and Americans to be as well fed and clothed as they are today, the partnership of farmer and industry must stay in active business.

Effect of Lysine Deficiency on Feather Pigment

The following is a condensation of an article on "Lysine in Poultry Nutrition" by F. H. Kratzer, University of California.

It was demonstrated more than 40 years ago that pure proteins vary greatly in their ability to promote growth. Rats fed gliadin and other proteins stopped growing until lysine was added to their diet. Similar experiments subsequently established the need for lysine in poultry feed. More recently, it was noticed that with certain proteins in their rations, turkey poults developed a lack of pigment or white bar in the feathers. This is one of the few instances in which the deficiency of an amino acid caused any symptom other than poor growth. Addition of lysine restored normal pigmentation.

Flight feathers of a poult fed a lysine-low ration for 24 days. The unpigmented portions of the feathers form a distinctive white bar across the wing of the bird.

Lysine requirement for the prevention of white bar increased with the rise in the total protein in the diet. The need is greatest during the first four weeks and drops after this initial rapid-growth period. Poults fed rations marginal in lysine may show a white bar during the first two weeks of age and then develop pigment normally on the same ration, as their requirement drops.

Since lysine is very poorly supplied by most proteins of plant origin, poultry rations based on cereals may be supplemented with animal proteins that make up the deficiency. Shortages in animal proteins have led to the use of soybean protein, another good source of lysine.

One of the problems in preparing supplemented feeds is the fact that lysine is relatively unstable and is rendered useless by some common heat treatments. In feeds with marginal amounts, such as cottonseed meal, destruction can severely affect the growth of birds.

How Lysine Works

The exact mechanism by which lysine influences pigment formation is obscure. It maintains proper functioning of the enzyme tyrosinase. Feather pulp removed from turkey poults fed lysine-deficient diet showed reduced tyrosinase activity, as compared to birds fed adequate diets.

The requirements of chicks and poults for lysine are much higher than for methionine. Therefore, probably greater amounts of supplemental lysine would have to be fed if synthetic material were to be used commercially.

Synthetic lysine would have to be available at a rather reasonable price to be used practically in competition with the natural sources in proteins. On the other hand, synthetic lysine would allow feed manufacturers a greater flexibility in the choice of proteins for feeds for young chickens and turkeys.

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Industrial Research To Make Agricultural Chemicals Safe

By WILLIAM D. HOGAN*
E. I. Du Pont de Nemours & Company, Inc.

The chemical industry must take for granted the fact that one of the largest single cost items in the development of biological chemicals is the research necessary to assure that these chemicals can be marketed without introducing a hazard to health.

Obtaining this kind of basic information before we market garden chemicals is part of our company's traditionally high standard of safety. It also provides some of the data we present to the federal government when we wish to register a pesticide for a specific use. The high standards of safety in pesticides have placed great emphasis on some highly technical aspects of analytical chemistry. When it is established under the law that a residue of only one part per million — or seven, or 14 — is legal, and any residue in excess is illegal, then it seems natural to wonder how anyone can tell the difference. One part per million, for example, is roughly equivalent to an ounce of pesticide evenly distributed in 30 tons of produce.

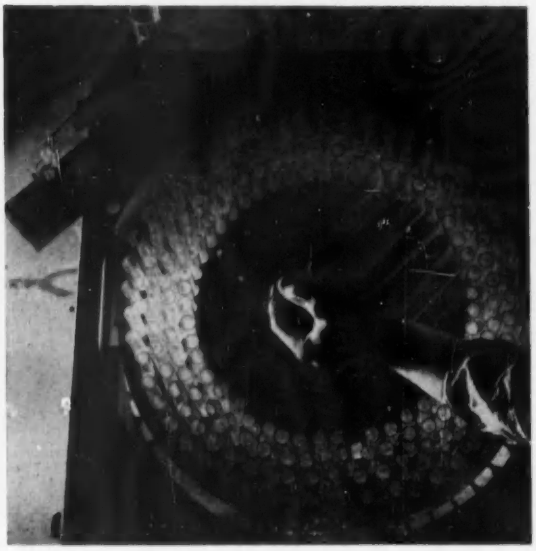
ORGANIC PESTICIDES

Fifteen years ago, when most pesticides were based on simple inorganic derivatives of lead, arsenic, sulfur, etc., the problem was more straightforward than today when complex organic compounds are the general rule. Today's analytical chemist working with pesticides is a specialist trained to use diverse tools—physical and electronic as well as chemical. It is his job to develop analytical methods to detect unmistakably the specific chemical and to measure accurately the minute amounts which may be present at harvest time. One common approach is to react the chemical, or some part of it, to form a characteristically colored dye, the intensity of color developed being a measure of the amount of active chemical present. And the chemist no longer has to depend on his own judgment to evaluate the end result — he uses a colorimeter or a spectrophotometer to measure the degree of color development.

Even with all of the technical skill of the chemist and the aid of the finest equipment and facilities, development of a satisfactory analytical method for a chemical often takes a lot of time. In addition, the validity of the method must be established for each new crop analyzed.

RESEARCH PROBLEMS CONTINUE

It would seem from what has been related that so much has been done there must be little left to do. This might be true if we were growing things in vacuum or a sterile laboratory instead of out under the sun and the moon, the wind and the rain. It seems that



SCIENTIST'S HAND reaches into array of test tubes in one of many tests undertaken by industry to determine safety for agricultural chemicals.

*Excerpts from an address delivered before the Soils and Crop Science Society of Florida, Clearwater, Fla.

HUNDREDS OF COMPOUNDS on laboratory shelf show vast number of products tested by Du Pont before new fungicide was discovered and prepared for market.

as fast as we take chemical steps to eliminate or greatly reduce species of insects, mites, nematodes, fungi and bacteria, and weeds, "Mother Nature" steps in to thwart our efforts. In order to stay a few jumps ahead of her, research must go on, not against a so-called biological balance but for a balance of "law and order." Just to cite a few of the newer weapons coming along I might mention: 1) antibiotics 2) systemic insecticides and fungicides 3) plant growth regulators 4) atomic energy.

CONTROL WITH ANTIBIOTICS

Antibiotics such as streptomycin, terramycin and aureomycin seem to have no detrimental effect on the growth of warm-blooded animals but are deadly to many bacteria. Experimental work has indicated promising results in the control of fireblight of apples and pears, "wildfire" in tobacco, walnut blight, bean blight, cotton wilt and others.

Systemic insecticides applied to the soil, to the foliage or injected into plants have no visible effect on the growth of the plant or the beauty of its flowers, but pests like aphids and mites which feed on the plant juices die and the plant may remain free of these pests for sometime thereafter. Plant-growth regulators may someday make blossoms last longer and extend the blooming period. With some plants they are already being used to simplify hybridization.

USE OF ATOMIC ENERGY

Even atomic energy is being applied to research in the field under discussion. Compounds can be made up with radioactive atoms which do not affect the normal behavior of the compound, but the course of the material through the plant can be watched with a Geiger counter. Thus it is possible to observe whether the material remains in the roots, moves to leaves, goes into the growing tip of the flower, or how it is otherwise utilized in the metabolism of the plant.

There is still a lot of good shooting ammunition left in our arsenal of agricultural chemical weapons which have hardly seen any more than a mere baptism of fire in the hands of farmers, once their fire power had been well established by the research scientist in his laboratory. While this shooting goes on and increases, I hope, one can rest assured that newer and more potent weapons are being forged on the anvil of necessity which never seems to cool off because of "nature's" constant struggle to fight off wholesale destruction of any of her species, be they hurtful or helpful, weeds or bugs, spores or blights.

AGRICULTURE YEARBOOK CITES PHENOTHIAZINE CONTRIBUTION

"Phenothiazine evolved in three periods: The discovery of its application as a standard anthelmintic (1938 - 1940); standardization and development of methods of using the drug to achieve effective control of parasites (1941-1948); and its greatly increased use (from 1948 on) in cattle, particularly free-choice and low-level systems of preventive medication of beef animals and dairy calves. The third stage marks an awakening to the importance of parasitism in cattle and a recognition of the benefit that may be derived from controlling subclinical parasitism in cattle and other livestock".

DISEASES OF ANIMALS (1956).

What A Future Farmer Expects From Agricultural Research

By LYNN LOOSLI
Pacific Region Vice-President
Future Farmers of America

(Following are excerpts from a speech made before the Agricultural Research Institute in Washington, D. C., entitled, "What a Future Farmer Expects from Agricultural Research." As Mr. Loosli explains, he based much of his discussion on an informal survey among young farmers.)

I decided to do a little research myself, so I took a list of some of the most promising boys in our organization, picked out over a dozen of the best, and wrote them about my problem. These boys will all receive the American Farmer Degree in a couple of days. This is the highest award given to boys who show outstanding proficiency in agriculture. They are already using most of the newest ideas in agriculture to achieve their high standing and in the future they will use the products that your research is discovering today.

I was very interested in finding what they needed of research in their part of the country and I'm sure you will be also.

Stable Agriculture

The unanimous opinion was that we all wanted a stable agriculture, free of political pressures and with a minimum of government control. Many of our city friends point out the high prices of consumer goods and believe that the farmer must be getting these prices. We need more and better help with our public relations so that people can see the real agriculture story.

Weather has been a problem of man through the centuries and is still a great concern of the farmers today. Many things have been done to help, but we all felt we needed still more advances to combat this problem.

Drought still is the main disaster, and irrigation, one possible solution. We need more development here. I found that many boys like myself have irrigation on their farms and some of us have sprinkler type systems for parts of the farm. Yes, we've all gotten up at four o'clock to change that first line and walked along through the mud knee deep pushing the vines apart to move the line to a new setting. Lots of thoughts run through your mind during that couple of hours of back breaking labor and most of the thoughts are: "How in the world can we make this job easier?" Labor costs appear never apt to go down, and even if you can afford the price, you couldn't find men to hire in our area, so you have to do the job yourself. You then say to yourself: "Well, this is better than it used to be with steel pipes, so I'm sure science will come up with a still better answer in the future."

IMPROVED IRRIGATION methods and lower costs are goals for future development.

Shortage of Water

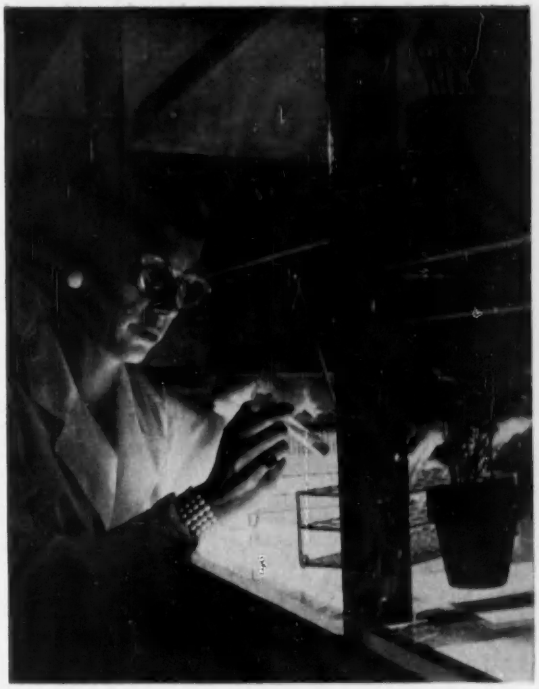
In areas such as New Mexico and Arizona, I found that the water table was dropping so fast that the boys couldn't afford to pump. They wanted a cheaper source of power--say even atomic power. They wanted systems that would last even longer, without the labor costs.

Almost all areas of our country have livestock and many a summer has been spent by a Future Farmer repairing fences. We all would like research on how to build better fences that are more durable. For instance, in my area, where we sometimes get three to four feet of snow in the winter, the saddest sight in the spring is the crushed fence, especially where the snow drifted extra high across it. But what's worse than the sight is the actual amount of time required to fix it.

Disease Control

I noticed in your reports from years before that you have done work with animal diseases and disorders, especially one common occurrence called bloat. When a Future Farmer is fitting a prime steer for the show, and disease or death strikes the animal, he is usually discouraged about entering the livestock field again. We want still more work on diseases,

VACCINE TO PROTECT against variety of diseases would make farm work easier.



HARDIER PLANTS to resist disease and weather conditions can increase production.

including using vaccines that will be more effective and last for longer periods of time. If you really want to please us, give us a single vaccine that will protect against a number of common diseases.

If any of you have ever handled cattle in chutes and corrals, you know that they are most unpredictable animals. Many a heated word is spoken because you get kicked trying to load them in a truck, vaccinate them, etc. I hope some day there is equipment that will take the place of all the man handling and bruising which occurs now.

LIVESTOCK EFFICIENCY

We still want more research done with livestock towards efficiency of production which will put on pounds of good red meat like the public desires instead of waste fat. We need more research along the feed lines to go with the better livestock we hope to get.

In the crops we want new species and varieties that would be more disease and insect resistant, produce more from the same amount of nutrients and water and be more resistant to weather and climatic conditions. We want crops that will be adapted to still smaller and more isolated zones. We want new crops that

FARM CHEMICALS that do more jobs better are goals of future research.

haven't been heard of today, that will not go into surplus problem but that will go on to cure people's disease, make better clothes, dyes, synthetics, and homes. We want crops that will grow more uniform and even. I would love to find in my potatoes a russet that would have perfect color and not become distorted in shape because I'm a day late or early with my watering. I would also like a plant that would set on the tubers at the same time so that when I harvest in the fall they will all be the same size, requiring little grading labor and sorting costs.

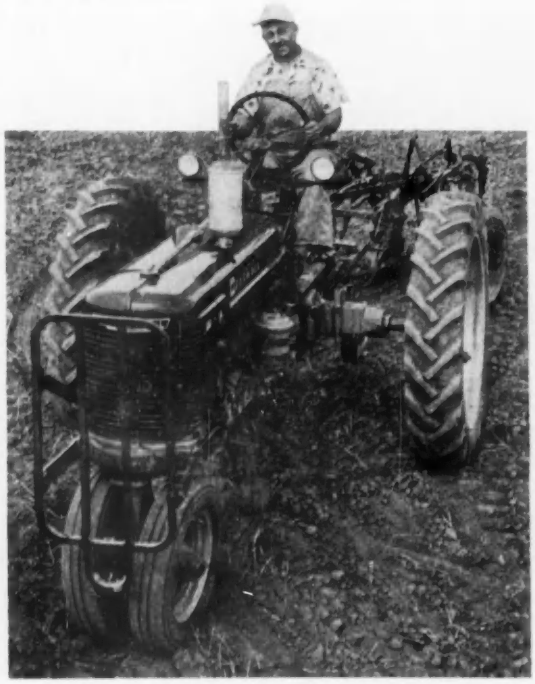
Improved Chemicals

We want more mixtures of fertilizer for our particular crops and soil conditions, that are safe to use and not caustic. We want to apply fertilizer with our seed; spray it on when we spray for insects or weeds, thus saving us steps and operations in growing our crops.

Many boys, including myself, want more sprays to kill our insects and weeds. We want sprays that are not specifically for one species of bug but that with one operation all our insects might be destroyed. I know that in the last few years, harmful insects and weeds have come into our area that have never before been there. We would like some help in combating these pests before they get to us or have multiplied greatly. My father and I were discussing the problem of morning glory, which he has on one of his farms. We both came to the conclusion that we would have to stop planting that land to potatoes or peas unless we could somehow rid it of the morning glory. Maybe there are solutions to these problems but many like myself haven't the answers.

Safer Machines

Machinery was commented on by everyone. You have read many times of the farm accidents that occur with farm machinery. We have a farm safety program in the Future Farmers organization, but we would like help from machinery companies to make the machines still safer for all concerned. A few boys brought out the problem of having to pay in the thousands of dollars for a machine like the combine that can be used for only two or three weeks a year. We would like to see these expensive machines adaptable to more jobs so we can use them throughout the year. We want machines that will last still longer with fewer wearing parts.



SAFER FARM MACHINERY is important factor in reducing accident rate.

Many, like myself, do most of our own repair work; and I've wondered many a time when I couldn't remove a worn bearing or a broken beam or rub bar without a half day's tearing the machine apart. "Why they don't consider the repair man in the construction of it." There are still many farm jobs that haven't yet been mechanized. We want machines to eliminate those jobs. In our own case, the potato harvest has been greatly improved, but still much has to be done to perfect it. I know this well because my father and I decided we would design and make a harvester ourselves. Well, for the past three summers every spare moment has been spent cutting, welding, and thinking to make the "thing", as we call it. We have learned lots, but I know for certain we haven't revolutionized potato harvesting. Already my father has everything planned as to what I have to take off and do over again for next year's crop, since he can't weld. This is no fun, and I'd appreciate it if someone would make a potato harvester that will work in our condition so we could buy it and do something else in the summer.

Future Research

I imagine that many of those things that my friends and I have asked for are already in production. We have had the best schooling available for young farmers of our age and, unquestionably, as a group we are better informed than our fathers were at this age. But still we do not have knowledge of the very latest information on what research has developed for our use. I would like to see more of those ideas reach future farmers so that we may learn how to use them in the future. I hope you continue to bring new and more revolutionary ideas into this business of farming so that others as well as my friends and myself will be able to live a fuller, happier, and more relaxed life.

Air Photos Identify Plant Disease

Aerial photography may become an important new tool in the fight against plant diseases by making possible early detection and treatment of infection centers. Research by scientists at the University of California has shown that photographs taken from two miles above the earth permit consistent identification of three common diseases of wheat and oats.

A careful selection of filters and films accentuates the difference in light reflectance of healthy and diseased plants. In several cases diseased areas have been shown up by aerial photographs, even though the same areas could not be detected in pictures taken from 10 feet away.

Once detected on high-altitude photographs, diseased areas may be photographed from lower altitudes of from 250 to 2,000 feet to detect the exact type of disease, estimate its severity, and predict the effect on crop yield.

Aerial photography has other important uses of interest to agriculture. It is commonly used to map soils and vegetation types, make wildlife inventories, measure timber volumes, and map important mineral deposits.

MEASURING AEROSOL DOSAGE

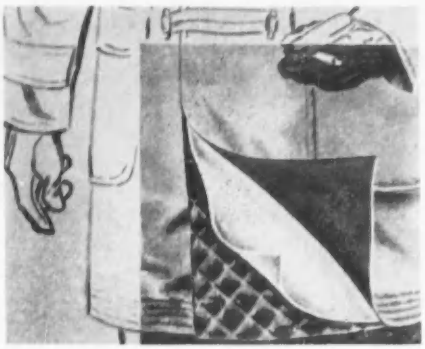
A recently developed metering valve makes possible administration of controlled amounts of drugs from aerosol containers regardless of the user's technique. The metering principle has already been applied to pharmaceuticals like hydrocortisone for treatment of dermatitis, epinephrine or isoprotenerol for relief of asthma, and octyl nitrite for the treatment of angina pectoris.

* * * * * *

Technological discovery increases the demand for goods partly by offering consumers new things that they are eager to buy and partly by directly creating new investment opportunities . . . The impact of technological discovery upon the economy is going to be greater in the immediate future than it has been in the last ten years.

—Prof. Sumner H. Slichter

new PRODUCTS AND APPLICATIONS



Farmers who must maintain activity in cold weather find special advantages in winter jackets lined with urethane foam. This material offers a combination of manufacturing and wearing advantages that are not possible with conventional interlining materials. The key feature is maximum warmth with low weight and little bulk thus allowing great freedom of movement. One producer reports that a one-eighth-inch thickness of urethane foam provides the same warmth as 14 to 16 ounce wool batting. DuPont makes some of the basic materials from which urethane foams are produced.

* * * * *

Soot that can cut the efficiency of oil, gas, or coal heating systems as much as 30 per cent over a five-day period, can be almost completely eliminated with a new aerosol spray. According to Steward-Hall Chemical Corp., Mt. Vernon, N. Y., the chemical, which is itself nonflammable, nonexplosive, and harmless to metal surfaces, reduces the ignition point of soot so that it can be burned out. The burner is shut off and the inside of the firebox is sprayed. The soot is then ignited with a torch made of a rolled up newspaper.

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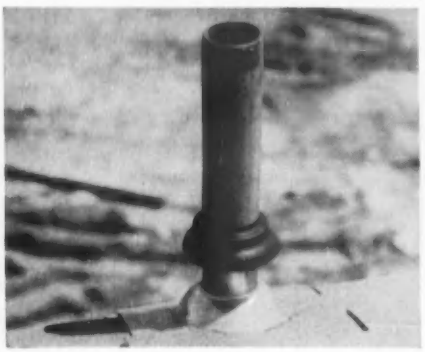

A leakproof neoprene weather seal that eliminates caulking, absorbs vibration, and resists weathering is available for use on service entrance mast installations on roofs. The unit contains a seamless base of aluminum, copper, lead, or zincplated steel, which is adjustable to all standard roof lines from flat to 45 degrees. The neoprene seal fits the contour of the base so snugly that no driving rain or snow may enter. Because of neoprene's inherent resistance to sunlight and weather, the seal should last the life of the building. (Acme Neoprene Weather Seal is made by McCaffrey Manufacturing and Supply Company, Chicago 8, Illinois).

* * * * *

Recently completed tests on nylon reinforced cotton work gloves show an overall saving of between 29 and 45 per cent over ordinary gloves. After experimenting with various blends of Du Pont nylon staple with cotton in the warp yarn (or wearing surface) of the fabric, researchers found a 50 - 50 blend looked most promising in both price and performance. In laboratory tests, this blend had more than twice the abrasion resistance of 100 per cent cotton. Actual work tests of gloves confirmed the laboratory findings.

Urethane foam weather stripping that seals out cold, rain, and snow is now available for use on garages and other buildings. The seal consists of a strip of vinyl with a urethane foam filled tube on each edge. A single strip is also available. The resilience of the foam allows the seal to form a snug fit, even over rough concrete floors. Urethane -- a remarkable new material made from Du Pont isocyanate chemicals -- is flame retardant and offers excellent resistance to ozone, sunlight, grease, oil and gasoline. Stripping kits include rust proof nails for installation. (This material is trademarked "Foamedge" and produced by Sterling Alderfer Company, Akron, Ohio).

* * * * *

Farm buildings with corrugated roofing or siding may be easily weatherproofed with resilient closure stripping made of non-porous neoprene. Die cut sections of cellular rubber can be installed as the building is erected. Strips are an inch wide and form a snug seal—proof against dust, water, and air.

Neoprene stripping is installed on roofing under the aprons of ridge roll and with flashing sections at roof junctions, side walls, or end walls. Corrugated siding is sealed at foundation level, and with flashing sections above and below windows and doors. This material is fastened at the same time as the corrugated sheeting. No separate caulking operations are necessary.

* * * * *

Light-weight work rubbers that go on easily over wide-last work shoes are made of Du Pont neoprene for long wear. Of special interest to dairymen and farmers, the new overshoes have extra high tops for added protection against splashing and molded soles that resist slipping. They are made to resist all kinds of farm and country wear, yet their weight is only eight ounces per shoe for the medium size. One-piece molded construction eliminates the usual fabric lining, thus providing a smooth inside surface easy to wipe clean. The "Hi-Top Work Rubbers" are made to fit any work shoe from size 6 to 13. (Tingley Rubber Company, Rahway, N. J.)

* * * * *

Of particular interest to farm housewives who have less access to commercial cleaning is a new kit for use on rugs, furniture, and auto upholstery consisting of a capsule of concentrated detergent and a DuPont cellulose sponge. To use, empty detergent into a half gallon of water. Squeezing the sponge through the liquid makes a thick foam which permits cleaning with minimum pressure and reduced drying time. This is suitable for cleaning wool, cotton, synthetics, and other material on which water can be used. (Manufacturer is Midwest Distributors, Chicago, Illinois).

Pushbutton Containers Make For Easier Medication of Livestock

While they may not guarantee a contented look on the cow, a wide variety of aerosol products are bringing push-button convenience to farmers and easier, more effective application of medicaments to their animal charges.

Biggest and most promising area of future development for the self-spraying dispensers is in the veterinarian field, where the aerosol package holds bright prospects for easing the treatment of normally jumpy and hard-to-handle animals. Products for external application of medicines already are available and, judging from recent progress in aerosol treatment of internal ailments in humans, the day might not be far distant when farmers will be administering oral doses of animal medicines from one of the push-button containers.

Screw Worm Control

Already on the market for stocking the barnyard medicine chest are preparations for control of screw worms and grub worms, both of which pests cost cattle farmers thousands of dollars yearly in hide damage and loss of productive meat. A single 12-ounce can of the screw worm spray, for example, treats 180 to 270 wounds, drives the medicine down deep into pockets and crevices of the wound to get a quick kill of screw-worm larvae, and protects the cattle from re-infestation for five to seven days. Containing a color dye that makes it easy to locate treated areas, the spray is recommended especially for use after castrating, dehorning, or docking, and on wire cuts and similar injuries.

FARM animals are easily treated with medicines in aerosol containers.

Another aerosol product is formulated for use against spinose ear-ticks in cattle, horses, goats, sheep, and other domestic animals. It is particularly effective because the soft, gentle mist not only is less painful to the animal but penetrates the masses of ear wax and ticks thoroughly and quickly, rapidly killing all larvae and nymphs and providing protection against re-infestation for three weeks or more.

Wound Dressing

There are wound dressings that not only act as disinfectants in open wounds but contain medicaments that combat infection in the wound as it heals. And if the wound is sufficiently serious to require bandaging, there's an aerosol plastic surgical dressing that can be sprayed simply over a wound or burn to give a transparent protective cover that's permeable to normal body fluids but provides a barrier against dirt or germs entering the wound during the healing process. The transparent coating permits the farmer to visually follow the healing without unnecessary removal of the dressing.

For small poultry flock owners, an aerosol vapor inhalant spray protects chickens against chronic respiratory disease (CRD). Containing dihydrostreptomycin, it's sprayed over the flock in the brooder house, usually at night when the chickens are roosting, so that the antibiotic settles down gently over them and

is inhaled into the respiratory tract. The manufacturer says one 12-ounce container of the aerosol spray treats 100 birds in 30 seconds for about 2¾ cents per bird, with one spraying usually sufficient to curb the disease.

Other aerosol poultry sprays, containing such chemicals as ephedrine alkaloid, chlorobutanol, menthol, eucalyptus, and oil of peppermint, are useful in treating non-infectious conditions of the upper respiratory tract of poultry and aid in loosening accumulated mucus in the chickens' noses and throats.

Human Applications

Of special interest to the farmer and outdoorsman are many of the 40 aerosol pharmaceutical applications for human medicine. On the current market are such products as topical or local anesthetics for use in dentistry and for skin planing, spray bandages, burn sprays, athlete's foot remedies, poison ivy sprays, adhesive tape remover, and balm for application to the skin to minimize irritation of adhesive tape dressing.

While veterinarian and medical products represent the newest application of the aerosol packaging principle to products for use on the farm, there are dozens of older ones of interest to the farmer — things like insecticides for use both in the home and on animals, insect repellents, fungicides, tomato blossom sets, touch-up paints and enamels, lubricants, rust preventives, water repellents, plastic protective coatings, ignition sprays to help assure dry, fast-starting engines.

HOSPITAL use of pushbutton containers is one of important medical applications.

Aerosol Advantages

Even though aerosol containers are higher priced than conventional packages, they present many advantages for pharmaceutical use in addition to ease of operation and minimum irritation of treated areas. Their efficiency often makes for greater economy and, since they are gas tight, they protect the contents from contamination, preserve the potency of the ingredients, and prevent evaporation during storage.

The 300 million aerosol packages sold in 1956 grew out of industrial and government research during the war on better methods of dispensing insecticides to combat insect-born disease. More than a hundred different types of products for household, personal, pharmaceutical, and industrial use have been developed so far, many of them using DuPont "Freon propellent (originally developed as a refrigerant) as their source of dispensing pressure.

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A chemical once used as stiffening agent for rubber is now being used indirectly to take the pain out of headaches. The chemical, Du Pont **para**-aminophenol Technical, is used to make acetyl-**para**-aminophenol, a new, fast-acting analgesic notable for the fact that it has few or no irritating side effects.

PARASITE LOSS

The annual loss from parasite infection on many farms may well be equal to the cost of a television set, a new piece of small equipment, or some other needed item, according to Dr. H. J. Griffiths, University of Minnesota.

CATTLE PICTURES symbolize changing eating habits of American consumers. Increased income made possible 47 per cent rise in beef eating with $1 billion annual addition to gross farm income.

Living Standard Rise Means Greater Income To Farmers

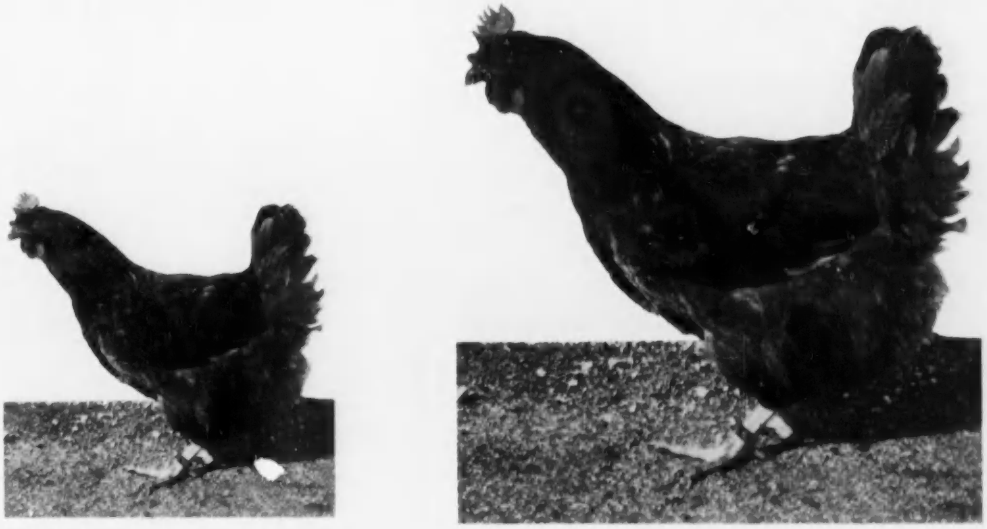
Changes in living standards during recent years have put hundreds of millions of additional dollars into the pockets of U. S. farmers. The 60 per cent rise since 1939 of the purchasing power of the average individual has brought with it dramatic shifts in the nation's eating habits from the high starch, low-cost diets of the past to today's high-protein, high-cost dinner table.

From the standpoint of both money income and total quantity, the most important change has been the 47 per cent rise in beef eating. Average consumption per capita today is in excess of 79 pounds per year, as compared to less than 54 pounds in 1939. If consumption were at the 1939 level today, the income loss to farmers would be about $1 billion. The 32 per cent increase in the per capita use of veal since 1939 is estimated to bring in about $100 million more in farm income.

These figures, however, measure only a part of the potential difference in cash income, because the change in quantity has been accompanied by a similar change in quality, thus raising the average price. The percentage of "choice" beef is up by about one-third over the pre-war level, while "good" and "commercial" grades have lost half their former market. The lowest "utility" grade has almost disappeared.

The greatest relative gain has been in the consumption of poultry and eggs, although a lesser dollar volume is involved than in the case of beef. The average consumer now eats about 24 pounds of chicken per year, a 71 per cent increase since 1939. The cash difference represented by the higher consumption level is about $300 million. Turkey is now about 5 pounds per capita, double the 1939 amount, representing an income gain of about $130 million. The more than 400 eggs eaten per capita today (over 34 per cent increase) mean a gain of more than $500 million each year to farmers. There have been similar changes in other foods (citrus fruits, for instance,) but the greatest total cash gain has been in meats and poultry.

Since total per capita food consumption over the pre-war period has gone up only 14 per cent, some of these increases have been offset by declines in other products such as pork and potatoes. The cash loss of these products is, however, far overbalanced by the gains. Pork consumption of less than 60 pounds per year today represents a loss of 6.6 per cent over 1939. If consumption were at the prewar level, the cash gain would only be $150 million. Lamb and mutton eating has been reduced by more than 30 per cent. But even if per capita consumption were increased to the 1939 volume of 6.5 pounds per person, it would mean a net



CHICKEN CONSUMPTION now averages 24 pounds each year per capita, an increase of 71 per cent; turkey eating has doubled and use of eggs increased by about one-third since 1939.

cash gain of only $50 million to farmers, about half the gain from the increased use of veal.

Income from potatoes is down about $200 million from what it would be at the 1939 consumption level of 112.5 pounds (as compared to less than 97 pounds today).

The increased spending for quality foods has been made possible by the technological changes which increased the nation's total income. A measure of this enlarged purchasing power was given in a recent Agriculture Department survey which found that average food consumption per family is now $27 per week, almost three times more than the $10 a similar survey showed 13 years ago.

The impact of industrial growth and the rise in industrial wages on the farm economy is shown by the fact that the average urban family spends $30 for food per week, as compared to the $17 average for rural families that use large quantities of home-produced foods. The average income also has a great bearing on food expenditures, since urban families with an income of less than $2,000 had an average food bill of $18, while families in the $5,000 to $6,000 range spent $34. The median income of all American families is over $5,500, which accounts for the high average spent on food.

The change in the American dinner [illegible] is still in progress and future consumers will undoubtedly demand more and better food products. Production of livestock and poultry will continue to show the greatest growth rate. The Agriculture Department has estimated that changed demand and increased population will in 20 years create the need for a 60 per cent increase in chick and broiler production, 50 per cent in cattle and calves, 19 per cent in eggs, and 32 per cent in milk. Feed for livestock will also have to be expanded, as will other crops. By way of contrast, there will probably be no need to grow more wheat or rice than today.

THE OUTLOOK FOR MEAT ANIMALS IN 1957

The past expansion has been truly spectacular. Since 1951, meat output has climbed from 22 to 28 billion pounds, a 28 per cent increase. Consumers have been treated in 1956 to their largest per capita ration of red meat since records began in 1899. Their average consumption will be about 163½ pounds. This will top for the first time the previous high in 1908.

Harold F. Breimyer,
U. S. Department of Agriculture

IS THE FARMER A BUSINESSMAN?

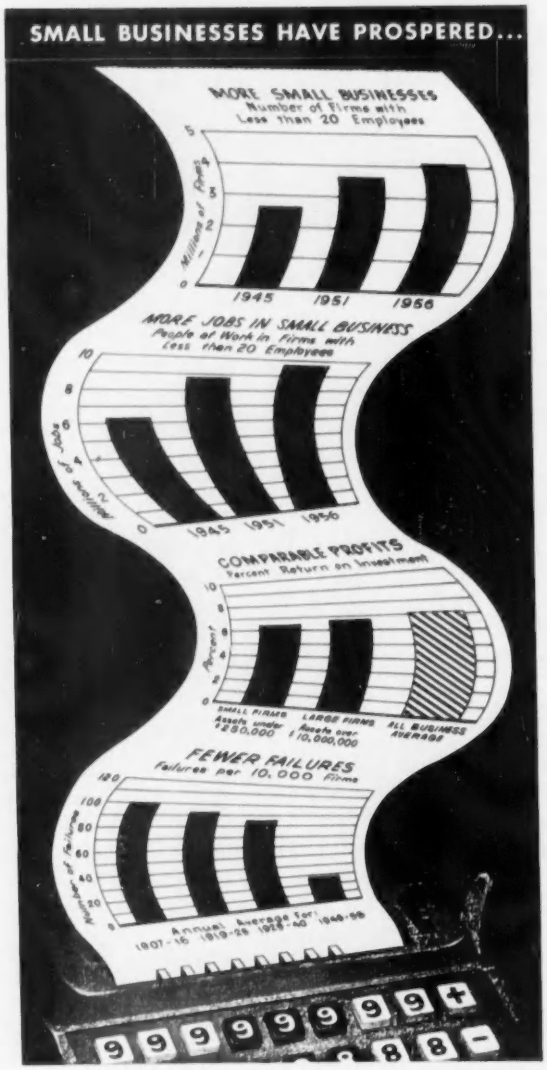
Du PONT BOOKLET TELLS STORY OF U. S. BUSINESS GROWTH

Because of the importance of business to farmers, both as a supplier of goods and services and a consumer of many farm products, the prospect of 1.5 million new firms in the next 20 years is immensely significant to the agricultural community. Farmers, too, are business operators with all the problems of businessmen. A new publication issued by the Du Pont Company points out that there will have to be a continuing growth of businesses of all sizes in the next 20 years if the needs of the growing population are to be met. Based on past records, there will have to be by 1976 a total of about six million businesses, a rise of 40 per cent. Big Businesses - those with more than 1000 employees -- may increase from 3500 to 7,000 in number, and they will have to be larger to provide the resources of money and men required by technological developments.

The new booklet, entitled "The Story of Business: Large and Small", analyzes the composition and structure of the U.. S. business community today. The 4.25 million businesses that now make up this community range in number of employees from one owner-employee to about 750,000. Their assets range from a few dollars to more than $14 billion. The most remarkable fact is that, despite the perennial legend that small businesses are vanishing, more than 98 per cent are small firms employing fewer than 50 people. Only a handful, less than one tenth of one per cent, can be considered large, having 1,000 employees or more.

New Opportunities

Small businesses are actually growing at a faster rate than large ones because of the expanding opportunities created by the rapid rise in living standards. Because incomes today allow more than the purchase of basic necessities, there has been a tremendous rise in the demand for services that often represent luxuries and improvements in living standards. (The parallel growth in demand for "built-in maid services" in food products is well-known to farmers.) Since the overwhelming majority of service firms are small, their growth has swelled the ranks of smaller firms. In fact, the number of people engaged in service-producing trades surpassed those in manufacturing, farming, and other goods-producing industries for the first time in 1955.

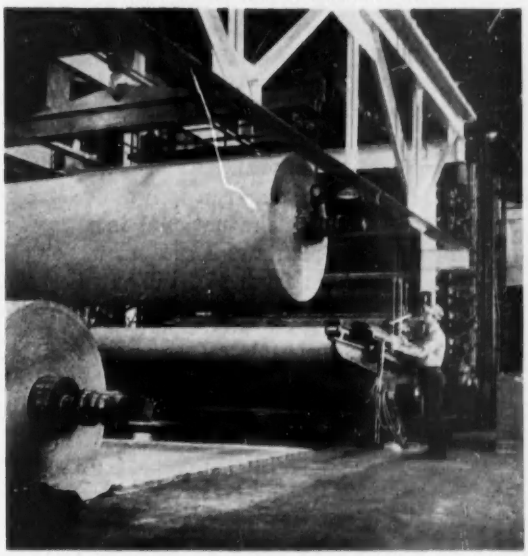


ADDING-UP, small businesses in the U. S. can take pride in their performance. Their number and employment are up. Their rate of failure, moving downward, is but a fraction of the average since 1907. Their profitability, reflected in corporate tax returns, is substantially equal to that of the largest firms. (All-business average is higher than either because medium-size firms, not shown here, earn a slightly higher rate than either small or large.)

TYPICAL SMALL BUSINESS

BARBER, Anthony Mezz, operates Wilmington shop with one other man. One to three employees is typical; shop with ten is in top one per cent in size.

TYPICAL LARGE BUSINESS



PAPER MAKER, St. Regis Paper Co., has 16,000 employees, $258 million assests. Nation uses over 25 million tons of paper products each year.

The factors that produce the great range of business sizes are directly related to the job that needs doing. How large a firm grows is controlled by the size and nature of the needs it seeks to fill and the skill that its management displays in filling them. Investment, technology and scope of the market generally determine the size range of various businesses. Among firms with fewer than 50 employees, two-thirds are in retail or wholesale trade. The larger firms represent a greater concentration in manufacturing.

For example, a barber shop with 10 employees ranks in the top one per cent of his field, but a trailer manufacturer with 10 times that many workers would be considered small. A company manufacturing farm machinery, automobiles, and trucks would be small if it had 100 times as many employees and vastly larger plant facilities. Factors affecting business size are shown by so common an item as cellophane which requires an investment of $25 million for an efficient production unit. Although cellophane could be made at home for $50 a pound, it would have no market, since factories can turn it out at 60 cents. A current model tractor could be hand-produced in a small workshop, but few could afford the $50,000 price tag.

Like Units Complete

Because of these diverse technical and investment requirements of businesses doing different jobs, there is relatively little competition between business of various sizes, although many critics have painted a picture of David fighting the industrial Goliath. For example the feed dealer, who has a small business, does not compete with the feed producer. The farm machinery repair shop is not in competition with the manufacturer. The sheet metal shop that makes guttering on the farm home does not compete with the steel industry. Competition is rather among like units and that form of competition provides better products at constantly greater values.

An example is a product widely used for the wrapping of food products, Du Pont cellophane. Although the company makes about 75 per cent of the nation's cellophane, it only has a fraction of the total market for similar wrapping materials, since it must compete with glasine, polyethylene, aluminum foil, waxed paper, and many other products which find their way onto the kitchen shelf.

**An illustrated booklet entitled "The Story of Business: Large and Small" may be obtained from the Public Relations Department, The Du Pont Company, Wilmington 98, Delaware. Simply mail the enclosed Postcard.*

Technology Is Key To Greater Production

Not since the disastrous drought of 1936 has so little farm land been tilled in the United States as in 1956, yet, technological advances made in recent years brought total U. S. output to its highest level in history. Crop production was equal to the 1948 record and livestock production above any previous year.

The Agriculture Department reports that the 1956 acreage used for growing the 59 leading crops was but a scant 1.6 per cent above the 1936 level, but 36 million acres (over 10 per cent) under the area used to grow the 1948 harvest, and almost 14 million acres below 1955. Thus the use of modern tools and chemicals has raised the productivity of the nation's land to a new high-water mark.

The farmer is using better tools for greater production in the same way that the industrial employee has increased his output per man-hour through the modern facilities provided him by industry. In both areas the progress in recent years has been phenomenal. Today's farmer produces on the average enough to feed 19 others, more than double the job he did 15 years ago. Industry's total production, too, has just about doubled in that period.

Doubled Productivity

Most impressive is the fact that productivity per man-hour of work on the farm has doubled since 1950. Thus, with a general decline in the number of farm workers and a reduction of one-third in the average number of hours worked, farm production itself has increased 35 per cent since that time.

The rapidity of farm mechanization — and the rise in the investment of farmers in modern tools — is demonstrated by the fact that the use of tractors and trucks has just about tripled since 1940. Grain combines are five times more numerous and corn pickers have increased 6.5 times. Illustrative of the startling change in agricultural methods is the increase in farm machinery value employed per hour of labor, as published for several geographic regions by the Department of Agriculture. In dairying (Central Northeast) the value increased from 22 cents to $1.15, in hog-beef fattening (Corn Belt) from 45 cents to $1.75, in winter wheat (Southern Plains) from 62 cents to $3.44.

In the investment per worker on farms the picture of change between 1940 and 1956 is similar: Cash grain (Corn Belt) increased from $19,000 to $59,000, in winter wheat (Southern Plains) from $11,000 to $54,000, dairying (Central Northeast) from $4,000 to $14,000.

Growing Investment

In U.S. manufacturing industry, investment stands at approximately $12,500 per worker today, as compared to under $3,000 in 1940. In a company like DuPont, which has placed great emphasis on new and more productive tools, investment per worker is twice the national average and, in more recently constructed plants which have the most up-to-date facilities, the investment needed to create a single job can run anywhere from $50,000 to $100,000. The national increase in spending for new plants and equipment for all industries has risen from $5.5 billion per year in 1939, to more than $35 billion in 1955.

Results of such a high rate of new facility construction is reflected in the substantial rise that has taken place in the output for each man-hour of work. In recent years the average increase has been about three per cent per year. In the vital steel industry the production per man-hour of time has grown better than 60 per cent since 1939.

Recognition of the importance of adequate incentives for new investments in better productive tools on the farm and in industry is a vital factor in the continuing ability of the nation to improve the general standard of living. No one is willing to invest in modern plants or modern machinery without the expectation of long-term stable production and profit.

Farmers Ask About . . . .

Q: Why must new insect-killing chemicals be constantly developed?

A: **First, to do the job easier and more efficiently, and, second, because insects often develop resistance to insecticides. For example, 10 different disease-carrying insect species have become immune to the insecticides generally used against them.**

* * * *

Q: What effect does the presence of low-grade parasite infection have on healthy-looking animals?

A: **The major effect is a depression of weight gains. In a study of mixed infection with gastrointestinal worms, for example, cattle treated with a suitable anthelmintic showed a daily weight gain from .06 to .40 pound per day more than comparable untreated animals.**

* * * *

Q: How big a market do farms provide for important industrial products?

A: **Agriculture Secretary Benson reports that farmers use some seven million tons of finished steel a year, 300 million pounds of raw rubber, more than 17 billion gallons of crude petroleum, and 12 billion kilowatts of electricity.**

* * * *

Q: How does phenothiazine work in controlling parasites?

A: **Phenothiazine owes its success primarily to its activity against the postadult stages of a large variety of gastrointestinal worms. Low levels of the drug either reduce the egg production of the worms or render the worm eggs incapable of developing into infective larvae, depending upon the worm species involved.**

* * * *

Q: Can meat animals be bred to provide consistent tenderness?

A: **Experiments made at the Agricultural Research Center, Beltsville, Md., show that tenderness is inherited and can, therefore, be passed on to succeeding generations of animals through selective breeding. Most of the work done has been with rabbits and, to a lesser extent, with cattle.**

* * * *

Q: What amount of work must the farmer do to pay his taxes?

A: **Twelve hours of work out of every 48 are required to pay the average farmer's tax bill, including all direct and hidden taxes, according to the Tax Foundation. Only one item in the farm home budget, food, takes more: 13 hours.**

* * * *

Q: Would an atomic blast seriously damage the nation's food supply?

A: **Government experiments show that all foods recovered intact beyond one mile from the center of an atomic target are safe to consume.**

* * * *

Q: What is the loss to farmers from weeds?

A: **The average loss from weeds is estimated at about $1,000 per farm—per year.**

* * * *

Q: How much food does the individual consume in this country?

A: **The average adult American eats about three-fourths of a ton of food each year. This is equal to eating his own weight in food every six to eight weeks.**

* * * *

Q: How much light is needed for laying hens?

A: **For top egg production, laying hens need 12 to 14 hours of light each day.**

Better Things for Better Living
. . . through Chemistry

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